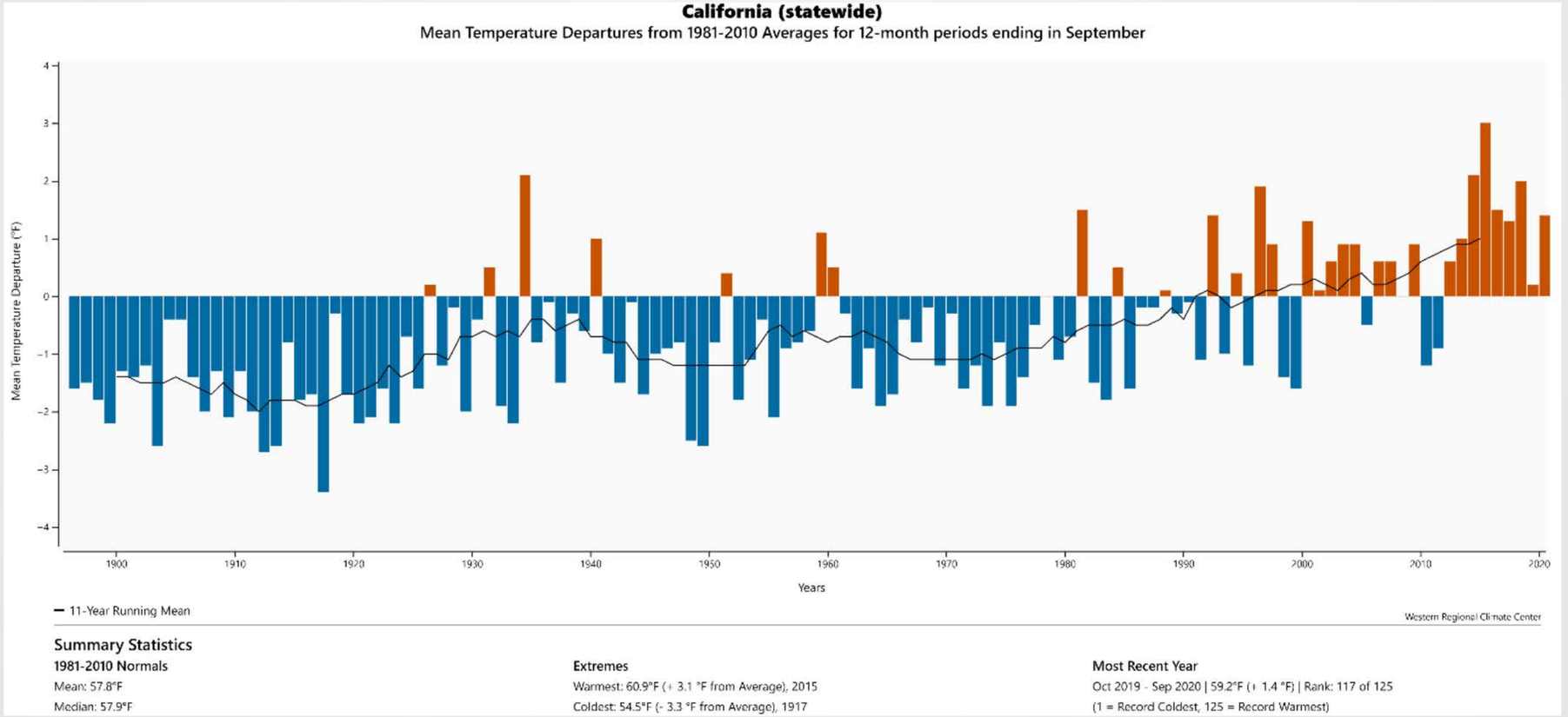
CALIFORNIA DEPARTMENT OF WATER RESOURCES

Forecast Improvement to Adapt to Climate Change

California Water Commission Workshop, February 16, 2022



Michael L. Anderson, State Climatologist

Talk Overview

- Water Year 2021 – New Extremes and Consequences
- Forecast Improvement Efforts
- Water Year 2022 Highlights

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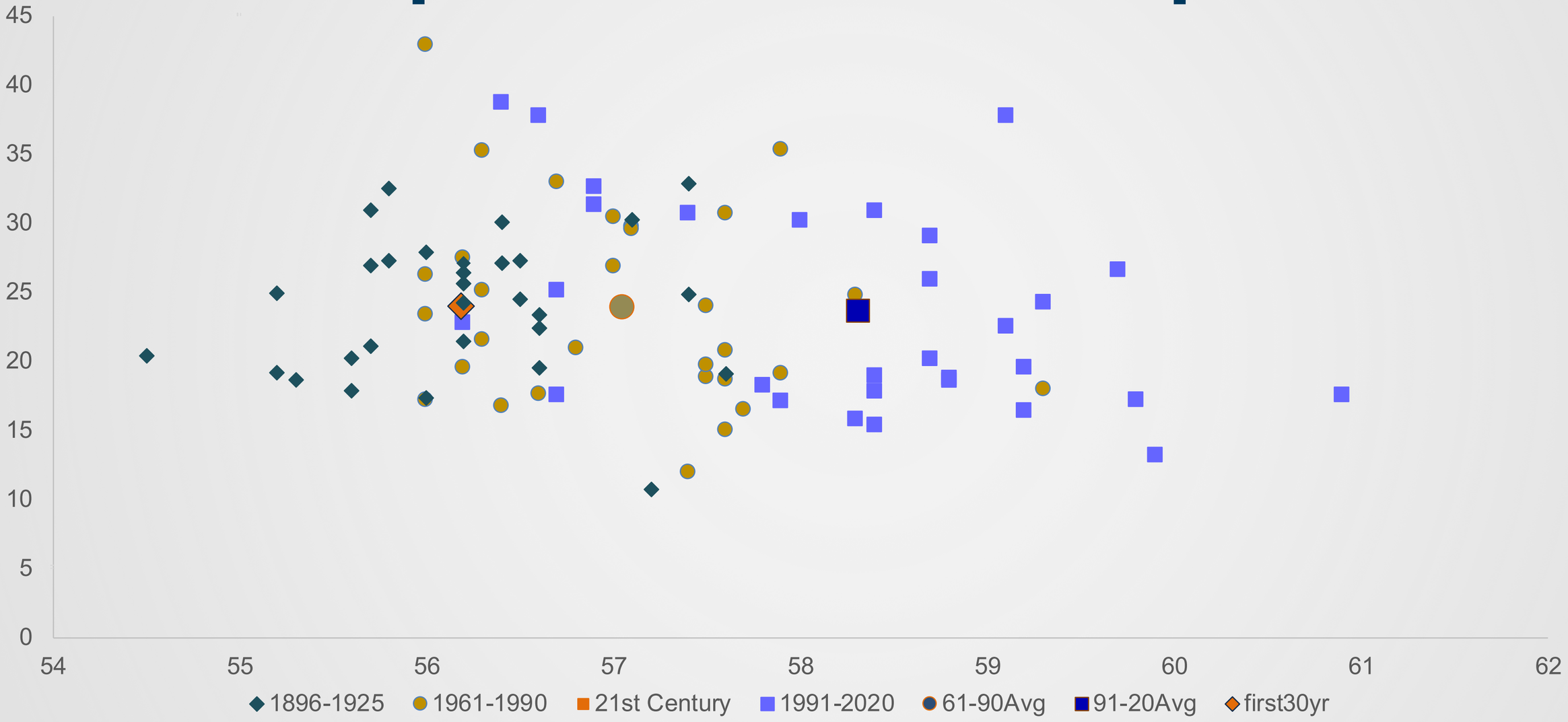
CA Temperature and Precipitation



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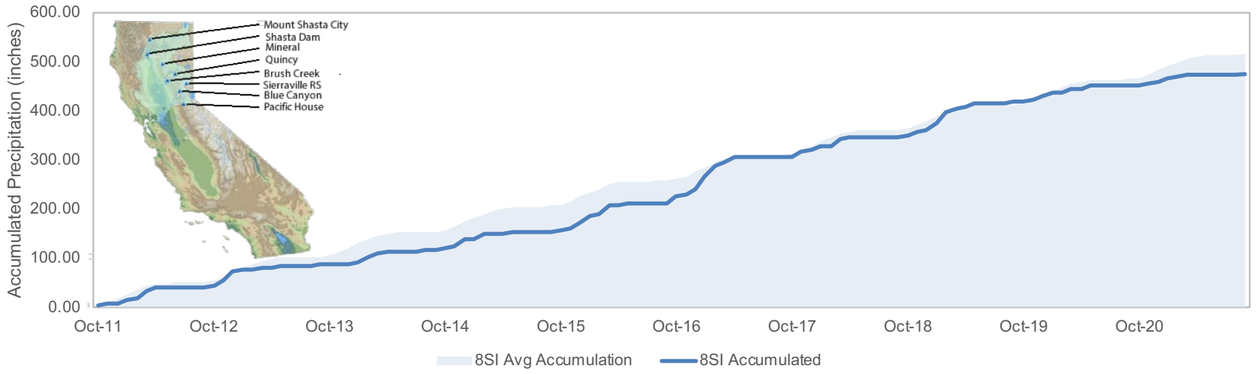
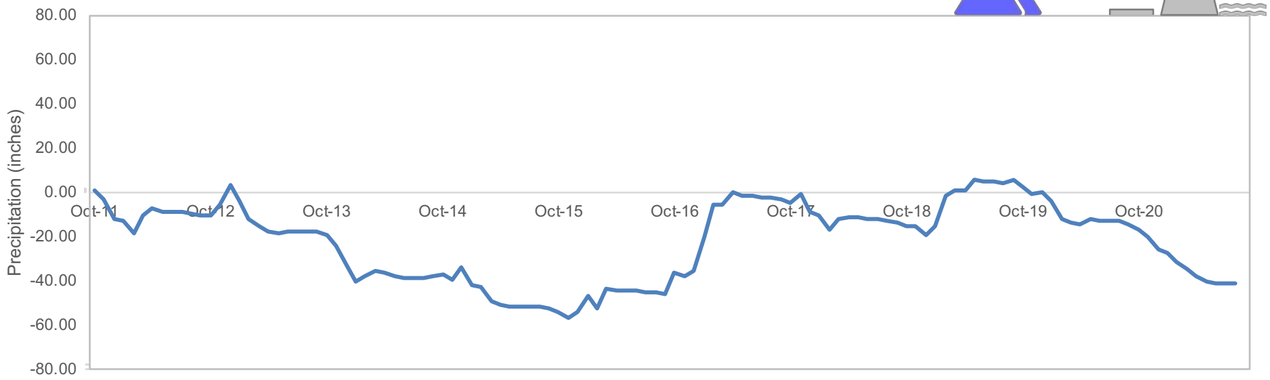
Water Year 2021 In Review

- Second driest single year for statewide precipitation
- Driest two-year period for statewide precipitation
- Second warmest year for statewide mean temperature
- Driest and warmest spring (AMJ) in 126 years of record

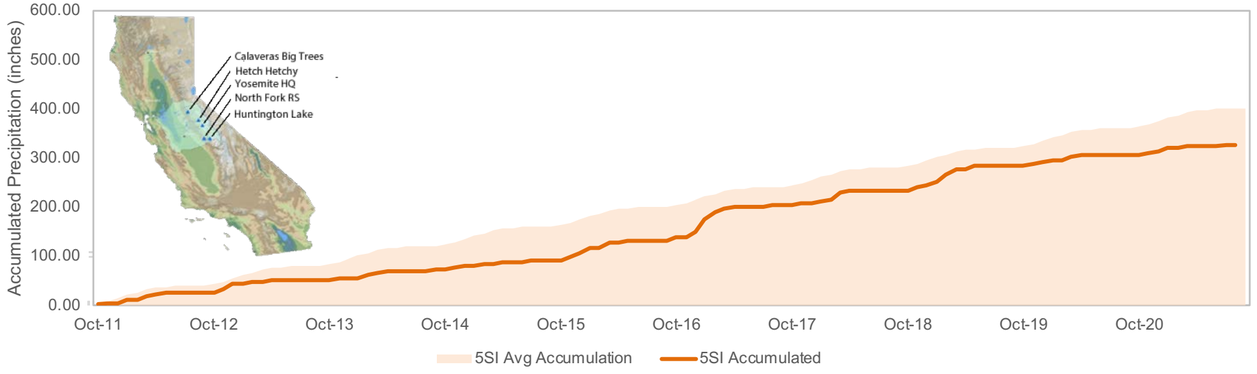
Northern Sierra 8-Station Precipitation Index
Departure from Normal Accumulation (WY2012-present)



Northern Sierra 8-Station Precipitation Index
Precipitation Deficit (WY2012-present)



San Joaquin 5-Station Precipitation Index
Departure from Normal Accumulation (WY2012-present)



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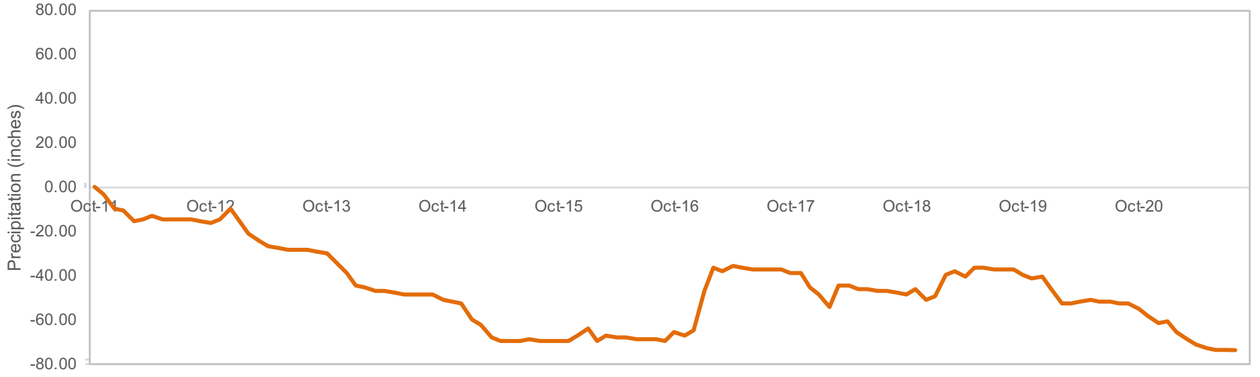
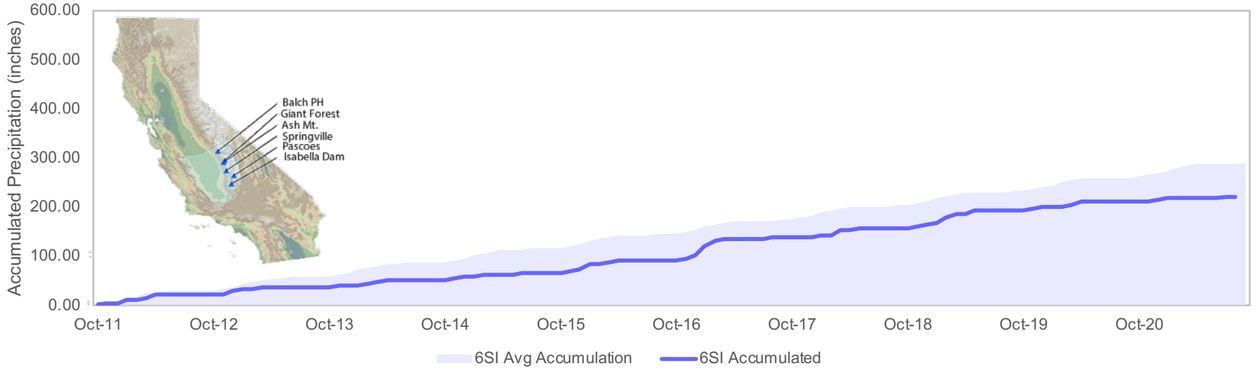


Tulare Lake 6-Station Precipitation Index
Departure from Normal Accumulation (WY2012-present)



Tulare Lake 6-Station Precipitation Index
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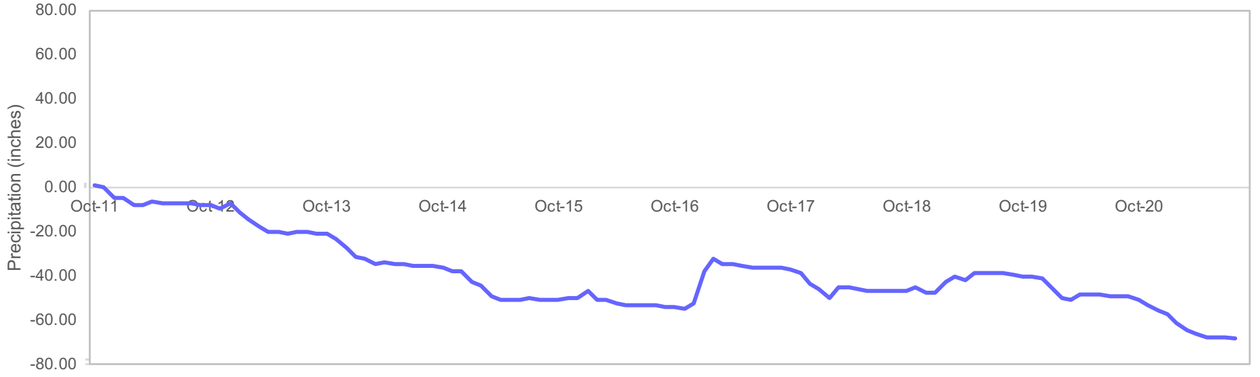


Forecast Improvements

Overall Vision:

Work with partners to adopt emerging technologies to:

- Improve and expand the collection of hydrometeorological data
- Develop physically based and climate informed runoff forecasting models

Two Implementation Periods

- 0-12 months
- 12-36 months

Three Strategies

- Data Augmentation
- Forecast Model Improvements
- Partner Collaboration

Forecast Improvements Underway

- Updating Hydrologic Averages from 50-yr average to 30-yr average to better reflect most recent years
- Update precipitation and snow median increments based on new averages
- Improve automation of daily precipitation data collection, full natural flow calculations and quality control process
- New methodology to evaluate and improve 90% and 10% exceedance forecasts
- Develop new statistical models based on updated data

Forecast Improvement Projects: 0 to 12 Months

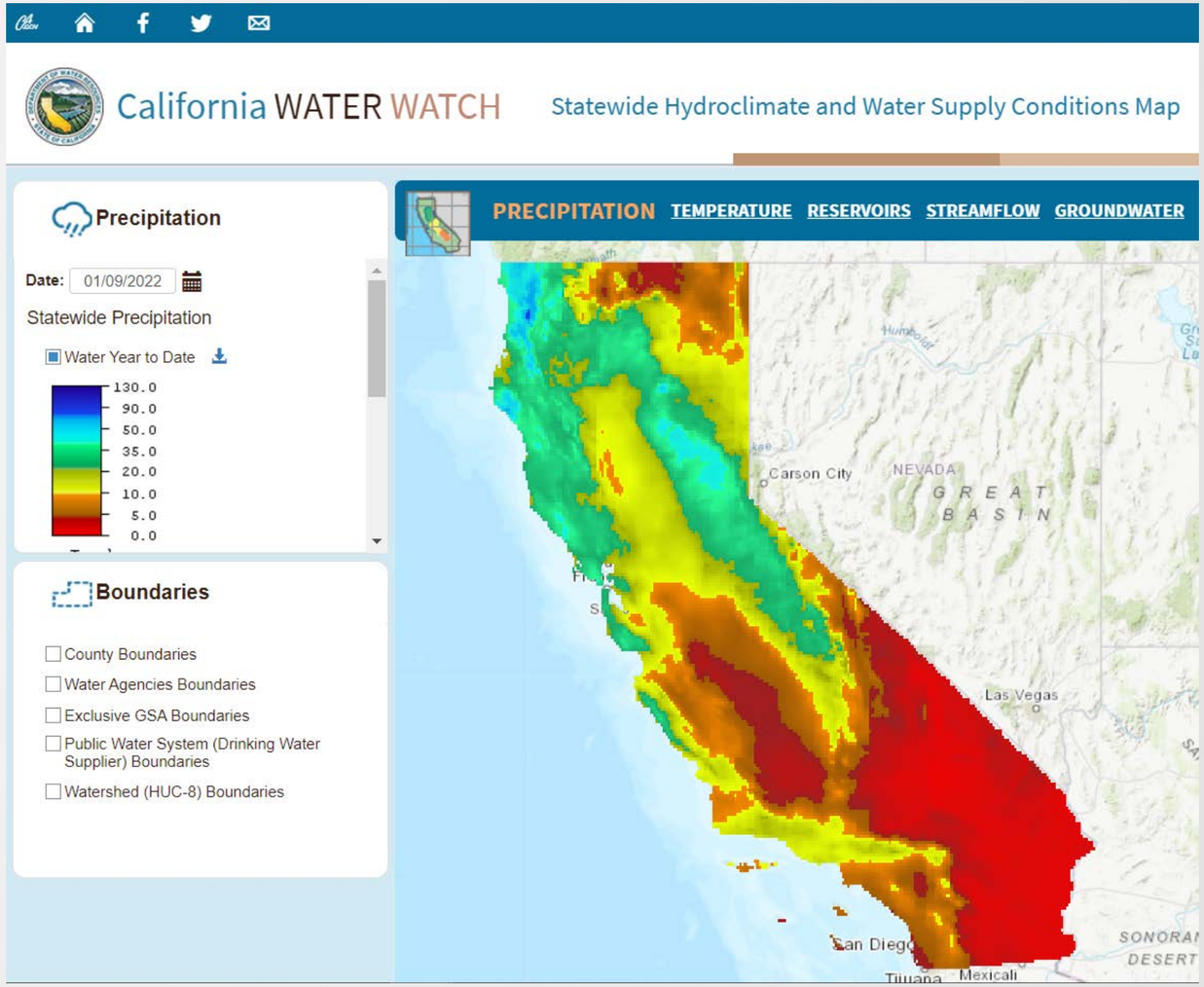
- Machine Learning (Artificial Intelligence) Models developed incorporating new variables
  - Climatic Water Deficit (USGS Basin Characterization Model)
  - Observed daily full natural flow (last 5 days of March/first 5 days of April)
  - Incorporate May 1 snow data
  - Separate out precipitation and snow parameters that were previously lumped
    - October-March full natural flow
    - October-March precipitation
    - April-June precipitation

Forecast Improvement Projects: 12 to 36 Months

- Integrate airborne remote sensing of snow data and modeling into forecasting process/expand coverage of airborne lidar data collection
- Integrate weather and climate forecast information into modeling process
- Continue partner collaborations to improve observation and forecast capabilities

California Water Watch

- Provides a snapshot of the state's water conditions at the local watershed scale, regional scale, and statewide scale
- Allows users to query hydroclimate and water supply information from a variety of sources, including:
  - Precipitation
  - Temperature
  - Reservoirs
  - Streamflow
  - Groundwater
  - Snowpack



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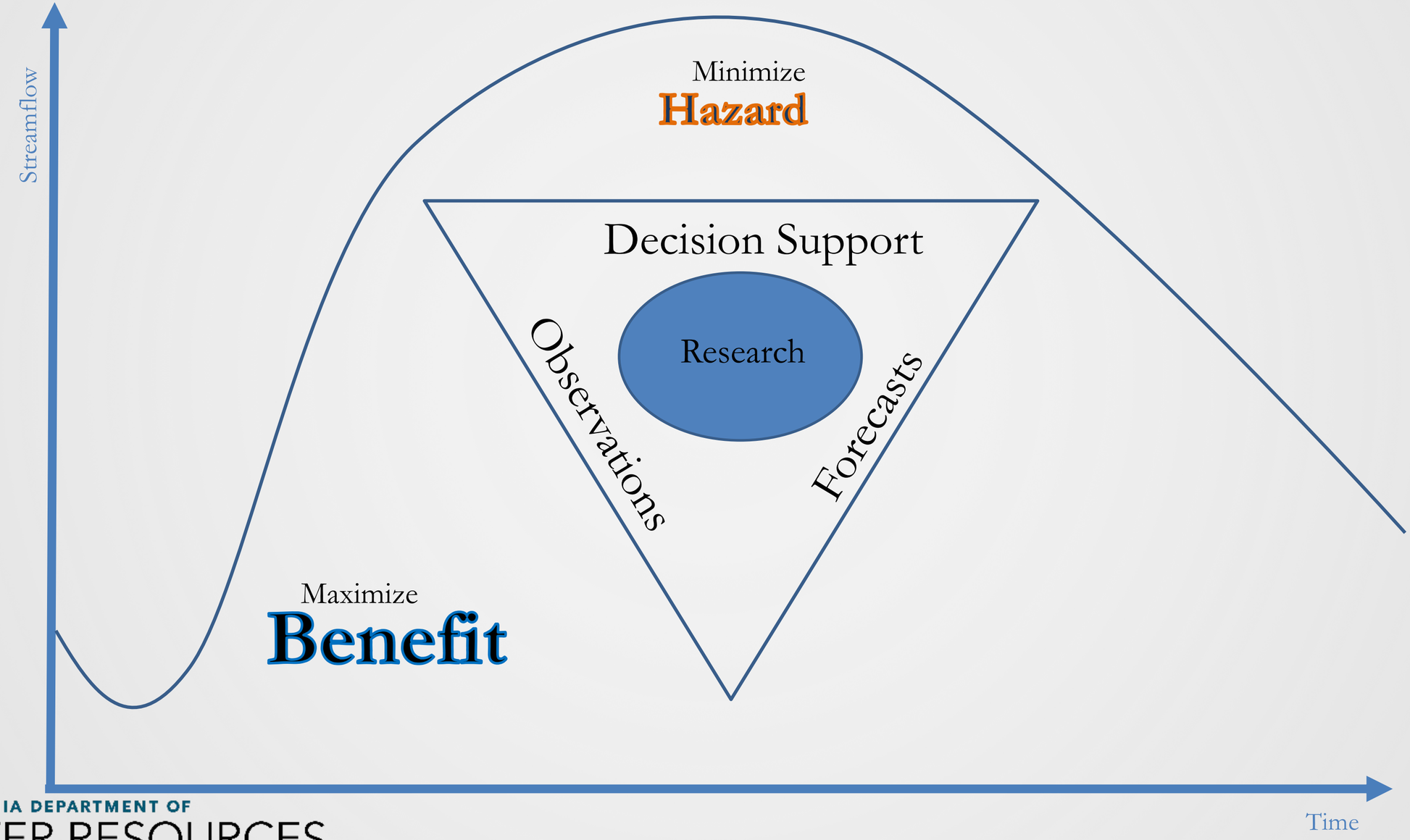
WY2022 to Date – Continuing Extremes

- Category 5 AR impacting California in October
- Less than 50% of average precipitation November
- Record snowfall at Central Sierra Snow Lab in December
- Oct-Dec statewide precipitation 155% of average (15th wettest in 127 years of record)
- Second driest January in 127 years of record

Adaptation Goal

Bring best available science into real time water management to **minimize the hazard** and **maximize the resource benefit** of each storm. Forecasts provide the time needed to implement a portfolio of water management solutions.



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Questions?

- Email: Michael.L.Anderson@water.ca.gov

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